

FLORA DA RESERVA DUCKE, AMAZONAS, BRASIL: DICHAPETALACEAE

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Dichapetalaceae Baillon, in Mart., Fl. bras. 12(2): 356. 1886, *nom. cons.*

Chaillietaceae R. Br., in Tuckey, Narr. Congo. Append. 5: 442-444. 1818.

Barth, F. 1896. Anatomie comparée de la tige et de la feuille des Triguniacées et des Chaillietiacées (Dichapétalées). Bull. Herb. Boiss. 4: 497-520.

Engler, A. 1896. Dichapetalaceae. In Engler & Prantl. Nat. Pflanzenfam. 3(4): 345-351.

Hallier, H. 1921. Beitrage zur Kenntniss der Linaceen (DC. 1819) Dumort. Bot. Centralbl. Biehefte 21: 1-178.

Prance, G. T. 1972. Monograph of Dichapetalaceae. Flora Neotropica 10: 1-84.

Trees, shrubs, or lianas. Leaves alternate, simple, with entire margins, pinnately nerved. Stipules present, often early caducous, entire, lobed, partite or fimbriate. **Inflorescences** axillary sometimes on leafless axillary or terminal shoots, cymose, distinctly branched to subcapitate or fasciculate, the peduncle free or adnate to petiole (or more rarely the midrib in Peruvian species). Bracts and bracteoles usually small. **Flowers** small, actinomorphic or zygomorphic, hermaphrodite or unisexual; pedicels usually articulated. Sepals 5(4), imbricate, equal to very unequal, free or slightly united or rarely forming a tube. Petals 5(4), either free and almost equal or connate into a tube with the lobes equal to very unequal, the lobes usually bifid at apex and most frequently bicucullate or inflexed, often clawed at base. Androecium of 2-5 fertile stamens and 0-3 staminodes, opposite sepals, free to base of receptacle or adnate to corolla tube, generally with filaments (anthers sessile in *Stephanopodium* which does not occur in Ducke); anthers bilocular, introrse, longitudinally dehiscent. Basal staminodes consisting of 1-5 equal or unequal hypogynous glands alternating with stamens, free or united into a disc, variously shaped. Ovary superior, free, 2-4(-5)-locular, with 2 ovules in each loculus, ovules anatropous, pendulous from top of each loculus, raphe ventral. Styles usually 1, more rarely 2-4(-5), free or more

frequently connate nearly to apex and 2-4 (-5)-lobed, the stigma capitate, 3-5 lobed. **Fruit** a dry or fleshy drupe, 1-3(-4) seeded; exocarp most frequently appressed pubescent sometimes dehiscent; mesocarp thin to thick; endocarp hard or parchment-like, indehiscent, glabrous or pubescent within. **Seeds** pendulous, generally without endosperm, embryo large, erect, with plano-convex cotyledons. Germination hypogeal, first leaves opposite or alternate. $2n = 24$.

The family consists of three genera and about 170 species distributed around the tropics. All three genera occur in the Neotropics, but only 2 in Central Amazonia and in the Reserva Ducke. Five of the 50 neotropical species are known to occur in the Reserva Ducke.

The family can be most easily recognised by the inflorescence which arises from the petioles in most species and by the bicucullate petals that give it its name.

Tapura is a genus of trees that has a fasciculate inflorescence that always arises from the petiole in Central Amazonia. *Dichapetalum* species of Central Amazonia are lianas, although tree species occur elsewhere and it has a lax branched panicle that is either axillary or petiolar in origin.

The family is of little known economic importance, the only recorded uses being in a few folk medicines. One African species of *Dichapetalum* is highly toxic.

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Many different relationships have been suggested for the family including Geraniales, Rosales, Thymelaeales, Celastrales and Euphorbiales. Although it is often placed near to the Euphorbiaceae it does not seem to fit well there. The most likely position based on anatomy (Barth 1896) and the staminodial

origin of the petals seems to be in the Geraniales (sensu Engler 1896) near to Polygalaceae and Trigoniaceae. Recent molecular studies indicate a relationship between Trigoniaceae, Chrysobalanaceae and Dichapetalaceae a grouping that was already suggested by Hallier (1921).

Key to the species of Dichapetalaceae of Reserva Ducke

1. Inflorescence a spreading cyme; petals equal; lianas.
 2. Leaf lamina thickly coriaceous, densely hirsute on lower surface; inflorescence dark brown to rufous pubescent 1.2 *Dichapetalum rugosum*
 - 2'. Leaf lamina thinly coriaceous, glabrous or with sparse pubescence on lower surface; inflorescence sparsely grey-puberulous.
 3. Leaf lamina ovate-elliptic, 8–30 × 4–16.5 cm, lower surface sparsely hirsute 1.3 *Dichapetalum spruceanum*
 - 3'. Leaf lamina elliptic to oblong, 5–16 × 2.5–9 cm, lower surface glabrous 1.1 *Dichapetalum odoratum*
- 1'. Inflorescence fasciculate; petals unequal; trees.
 4. Fertile stamens 5; leaves chartaceous 2.3 *Tapura lanceolata*
 - 4'. Fertile stamens 3; leaves coriaceous.
 5. Leaves hirsute beneath, petioles and inflorescences densely tomentellous 2.1 *Tapura amazonica*
 - 5'. Leaves glabrous beneath; inflorescences and flowers grey-puberulous 2.2 *Tapura guianensis*

1. *Dichapetalum*

Dichapetalum Thouars, Gen. Nov. Madag.: 23. 1806.

Lianas, shrubs or rarely small trees.

Inflorescence axillary, adnate to petiole or in axil, usually a pedunculate cyme, rarely a sessile glomerule. **Flowers** usually hermaphrodite rarely unisexual. Petals equal, free to base or shortly connate, entire or bilobed at apex. Stamens 5, equal, free to base or connate at extreme base only, with distinct filaments. $2n = 24$ or 96.

Type species: *Dichapetalum madagascariensis* Poir. The name refers to the deeply divided petals characteristic of *Dichapetalum* and *Tapura*.

About 135 species, 90 in Africa, 7 Madagascan, 20 Neotropical, from Mexico to Central Brazil, and 16 in S.E. Asia, Malesia and the Pacific. Three species have been collected in Reserva Ducke.

1.1 *Dichapetalum odoratum* Baillon in Mart., Fl. bras. 12(1): 371. 1886.

Liana, the young branches puberulous to glabrous. **Leaves** elliptic to oblong, chartaceous to coriaceous, 5–16 × 2.5–9 cm, acuminate at apex, with acumen 5–15 mm long, rounded to cuneate, and equal or slightly unequal at base, plane not bullate above, glabrous or with a few stiff appressed hairs on primary venation beneath; midrib more or less plane, sparsely puberulous to glabrous above; primary veins 7–9 pairs, slightly prominent above; venation plane to prominent above; petioles 4–8 mm long, puberulous to glabrous. Stipules linear-lanceolate, to 5 mm long caducous, the margins entire. **Inflorescences** spreading axillary or petiolar panicles, the rachis and branches grey-tomentellous. Bracts and bracteoles 0.5–1 mm long, lanceolate, persistent, puberulous. **Flowers** hermaphrodite; pedicels 1–3 mm long. Calyx 1.5–2 mm long, grey-puberulous on exterior,

the lobes equal. Corolla of 5 equal lobes, deeply bifid, glabrous, free to base. Fertile stamens 5, alternating and equalling corolla lobes. Disc of 5 short united glands, the apices bifid. Ovary bilocular with 2 ovules in each loculus, lanate on exterior. Style lanate on lower portion, the apex trifid. **Fruit** not seen.

23.IV.1996 (fl) *Ribeiro, J. E. L. S. & Assunção, P.A.C.L. 1818* (INPA K MG MO NY RB SP U UB); 19.V.1997 (fl) *Sothers, C. A. et al. 985* (BM G INPA K MBM MG UEC US).

1.2 *Dichapetalum rugosum* (Vahl) Prance, *Acta Bot. Venez.* 3: 303. 1968.

Symphyllanthus rugosus Vahl, *Skr. Naturhist-Selsk.* 6: 86. 1810.

Liana, the young branches tomentose to tomentellous, becoming glabrous with age. **Leaves** oblong to ovate-elliptic, thickly coriaceous, 6–32 × 3.5–21 cm, most frequently acute but varying from rounded to acuminate at apex, subcuneate, rounded or subcordate at base, plane not bullate, or weakly bullate only above, densely hirsute beneath; midrib plane and pubescent above; primary veins 7–13 pairs, slightly impressed above; petioles 2–35 mm long, densely tomentose. Stipules lanceolate, 2–4 mm long, subpersistent or caducous, densely tomentose, the margins entire. **Inflorescences** terminal, axillary or petiolar corymbose panicles, 1.5–8 mm long, the rachis and branches tomentose. Bracts and bracteoles triangular, 0.5–3 mm long, persistent, tomentose. **Flowers** hermaphrodite; pedicels 0.5–2 mm long. Calyx 3–3.5 mm long, densely ferruginous-tomentose on exterior, the lobes equal. Corolla of 5 equal lobes, bifid and weakly cucullate at apex, free to base, glabrous. Fertile stamens 5, alternating with and equalling corolla lobes. Disc of 5 separate bifid glands, united at base. Ovary bilocular or trilocular with 2 ovules in each loculus, lanate on exterior. Style lanate at base, glabrous above, the apex shortly trifid. **Fruit** unilocular or bilocular; epicarp densely velutinous tomentose; mesocarp thin; endocarp very thin, hard, bony, glabrous within.

Type: FRENCH GUIANA. *Herb. Vahl. s.n.*, (fl) (holotype, C).

Primary and secondary forests on non-flooded ground, savannas, and steam margins in the Guianas and Amazonia, and west to the foothills of the Andes in Peru and Colombia.

20.III.1996 (fr) *Campos, M. T. V.A. et al. 563* (INPA K MG); 15.III.1996 (bd) *Costa, M. A. S. et al. 481* (INPA); 4.VI.1995 (fr) *Sothers, C. A. 494* (INPA); 23.I.1998 (fl) *Sothers, C. A. 1091* (INPA K MG MO NY RB SP U UB).

1.3 *Dichapetalum spruceanum* Baillon in *Mart., Fl. bras.* 12(1): 371. 1886.

Scandent **shrub** or **vine**, the young branches tomentellous becoming glabrous with age. **Leaves** ovate to elliptic, coriaceous, 8–30 × 4–16.5 cm, abruptly acuminate at apex, the acumen 5–10 mm long, usually curved, rounded to cuneate and unequal at base; plane not bullate above, sparsely hirsute or with a few still appressed hairs only beneath; midrib more or less plane above, pubescent when young; primary veins 8–10 pairs, plane to slightly impressed above; venation plane to slightly impressed above; petioles 7–15 mm long, sparsely short-tomentellous or puberulous when young. Stipules to 8 mm long, lanceolate, tomentellous, caducous, the margins entire. **Inflorescences** axillary and petiolar spreading panicles, 4–6.5 cm long, the rachis and branches shortly puberulous; peduncles 8–30 mm long. Bracts and bracteoles triangular, 0.5–2 mm long, persistent, tomentose. **Flowers** hermaphrodite; pedicels *ca.* 0.5 mm long. Calyx *ca.* 2 mm long, grey-tomentose on exterior, the lobes equal. Corolla of 5 equal lobes, the apex deeply bifid, slightly cucullate, free to base, glabrous. Fertile stamens 5, alternating and equalling the corolla lobes. Disc of 5 glands, the apices lobed. Ovary bilocular or trilocular, with 2 ovules in each loculus, lanate on exterior.

Style with bifid or trifid apex, glabrous except for lanate base. **Fruit** ellipsoid; epicarp with short dense appressed pubescence; mesocarp thin; endocarp thin, hard, glabrous within.

Type: PERU. SAN MARTÍN: Tarapoto, *Spruce* 4927, (fl) (holotype, K; isotypes, BM CGE P W).

Forest on terra firme of Western and Central Amazonia in Brazil, Colombia, Ecuador and Peru.

18.I.1990 (st) *Gentry, A. H. & Nelson, B. W.* 69203 (INPA); 16.IV.1998 (st) *Prance, G. T. et al.* 30859 (INPA K); 18.I.1996 (fl) *Sothers, C. A.* 767 (INPA K); 3.XII.1997 (bd) *Sothers, C. A. & Assunção, P. A. C. L.* 1055 (INPA K).

2. *Tapura*

Tapura Aubl., Hist. Pl. Guiane 1: 126, t. 48. 1775.

Tree or shrubs. **Inflorescence** usually a small sessile or shortly pedunculate glomerule adnate to petiole (rarely an axillary glomerule borne on a long peduncle free from petiole). **Flowers** usually hermaphrodite rarely unisexual. Petals connate at base to form a distinct tube or free almost to base, with 1–2 large broad lobes with bicucullate divided apex, the other 2–4 smaller, linear-lanceolate, entire. Stamens 2–3 or 5 fertile, adnate to corolla tube or to base of corolla in species with free petals, with distinct filaments.

Type species: *Tapura guianensis* Aubl. The name *Tapura* is derived from a local name in French Guiana.

Twenty Neotropical species from Mexico and the Caribbean to Central Brazil, and 8 in Africa. Two species occur in Reserva Ducke and a third is likely to occur.

2.1 *Tapura amazonica* Poepp. & Endl., Nov. Gen. Sp. Pl. 3: 41, t. 246. 1842.

Tree to 30 m tall, usually much smaller, the young branches fulvous-tomentose, becoming glabrous with age. **Leaves** elliptic to obovate-oblong or oblong, thickly coriaceous, 3–25 × 3–9 cm,

obtuse to shortly acuminate at apex, the acumen 0–10 mm long, rounded to cuneate and often slightly unequal at base, usually plane rarely slightly bullate above, sparse to dense-hirsutulous beneath; midrib impressed above, prominent and pubescent when young beneath; primary veins 8–22 pairs, arcuate, anastomosing near margins; petioles 6–16 mm long, tomentose, canaliculate. Stipules triangular, 2–4 mm long, pubescent, subsistent. **Flowers** hermaphrodite, sessile or with short pedicels 0.25–2 mm long; borne in dense glomerules on upper portion of petioles; bracteoles 0.5–1 mm long, persistent, tomentose. Calyx 3.5–5.5 mm long, tomentose on exterior, the lobes unequal. Corolla exceeding calyx lobes, with 2 larger bicucullate lobes and 3 smaller simple lobes, united at base into a very short tube, the tube glabrous on exterior, filled by a lanate mass of hair within. Fertile stamens 3, alternating with corolla lobes, and inserted at mouth of short corolla tube, 2 staminodes present. Ovary 3 locular with 2 ovules in each loculus, pilose on exterior. Style with a trifid apex, pubescent throughout. **Fruit** oblong-ellipsoid, to 3 cm long, unilocular or bilocular; epicarp shortly appressed velutinous pubescent; mesocarp 1–4 mm thick; endocarp thin, hard, bony, glabrous within.

Type: BRAZIL. AMAZONAS: Tefé, *Poeppig* 2673, (fr) (holotype, W; isotype, F).

Forest on terra firme throughout the Guianas and Amazonia and extending into the cerrado region of Central Brazil.

17.VII.1997 (fr) *Assunção, P. A. C. L. et al.* 550 (INPA K MG MO NYR RB SP U); 24.XI.1993 (fl) *Ribeiro, J. E. L. S. et al.* 1177 (INPA K MG); 27.IV.1994 (fr) *Ribeiro, J. E. L. S. et al.* 1283 (INPA K MG MO NY RB SP); 12.VIII.1964 (fr) *Rodrigues, W. & Monteiro, O. P.* 5994 (INPA); 6.V.1965 (fr) *Rodrigues, W. & Monteiro, O. P.* 6921 (INPA); 14.V.1965 (fr) *Rodrigues, W. & Monteiro, O. P.* 6929 (INPA); 3.X.1968 (fr) *Souza, J. A. & Coêlho, L.* 207 (INPA).

2.2 *Tapura guianensis* Aubl., Hist. Pl. Guiane 1: 126, t. 48. 1775.

Tree to 10 m tall or **shrub**, the young branches glabrous or sparsely puberulous, soon becoming glabrous. **Leaves** most frequently oblong to ovate-elliptic, rarely oblong-lanceolate or lanceolate, coriaceous. 6–23 × 2.1–9 cm, acuminate at apex, the acumen 4–18 mm long, rounded to cuncate and unequal at base, glabrous or with a few still appressed hairs beneath; midrib impressed above, prominent and glabrous or with a few still appressed hairs only beneath; primary veins 7–14 pairs, arcuate, anastomosing; petioles 5–14 mm long, sparsely puberulous to appressed pubescent when young becoming less pubescent with age, rugose, terete to shallowly canaliculate. Stipules lanceolate, to 2 mm long, caducous. **Flowers** hermaphrodite, sessile or on short pedicels, borne in dense sessile glomerules inserted on upper portion of petioles; bracteoles 0.5–1 mm long, persistent, pubescent. Calyx 3.5–5.5 mm long, tomentellous to sparsely puberulous on exterior, the lobes unequal. Corolla exerted beyond calyx lobes, consisting of 2 larger bicucullate and 3 smaller simple lobes, united at base to form a long tube, the tube glabrescent on exterior, filled by a dense lanate mass within. Fertile stamens 3, alternating with corolla lobes, the filaments inserted on corolla tube at base of the lobes, the bases densely pubescent, 2 staminodes present. Ovary 3 locular with 2 ovules in each loculus, pilose-tomentose on exterior. Style with trifid apex, pubescent throughout. **Fruit** ellipsoid to narrowly oblong, most frequently unilocular, but often bilocular; epicarp with a short compact velutinous pubescence; mesocarp very thin; endocarp very thin, hard, bony, glabrous within.

Type: FRENCH GUIANA. *Aublet s.n.*, (fl) (BMP).

Primary forest on flooded and non-flooded ground in the Guianas and Amazonia.

15.X.1967 (fl) *Albuquerque, B. W. P.* 67-88 (INPA); 8.IX.1994 (fl) *Assunção, P. A. C. L.* 45 (INPA K MG MO NY R RB SP U); 14.XI.1995 (fl) *Assunção, P. A. C. L.* 249 (INPA K MG MO NY R RB SP U); 23.VIII.1997 (fl) *Assunção, P. A. C. L. & Pereira, E. C.* 638 (BM G INPA K MBM MG UB UEC US); 19.I.1990 (st) *Gentry, A. H. & Nelson, B. W.* 69244 (INPA); 4.XI.1994 (fr) *Nascimento, J. R. & Silva, C. F.* 625 (INPA K MG MO NY R RB SP U); 6.IX.1966 (fl) *Prance, G. T. et al.* 2197 (INPA); 9.IX.1966 (fl) *Prance, G. T. et al.* 2243 (INPA); 14.IX.1971 (fl) *Prance, G. T. et al.* 14747 (INPA); 15.IX.1987 (fl) *Pruski, J. F. et al.* 3257 (K); 24.XI.1993 (bd) *Ribeiro, J. E. L. S. et al.* 1184 (INPA K); 14.VIII.1957 (fl) *Rodrigues, W.* 519 (INPA); 1.XII.1959 (fr) *Rodrigues, W. & Coêlho, D.* 1385 (INPA); 26.IX.1961 (fl) *Rodrigues, W. & Coêlho, L.* 2528 (INPA); 8.VIII.1963 (fl) *Rodrigues, W.* 5428 (INPA); 9.II.1965 (fr) *Rodrigues, W. & Monteiro, O. P.* 6862 (INPA); 30.XII.1965 (fl) *Rodrigues, W. & Monteiro, O. P.* 7377 (INPA); 23.I.1967 (fr) *Rodrigues, W. & Monteiro, O. P.* 8310 (INPA); 2.IX.1994 (bt) *Sothers, C. A.* 157 (INPA K MG MO NY R RB SP U); 2.IX.1994 (bt) *Sothers, C. A.* 158 (INPA K MG MO NY R RB SP U); 4.XII.1969 (fl) *Souza, J. A.* 321 (INPA).

2.3 *Tapura lanceolata* (Ducke) Rizzini, Revista Bras. Biol. 12: 105. 1952.

Gonypetalum lanceolatum Ducke, Bull. Mus. Hist. Nat. Paris 11. 4: 737. 1932.

Small to medium sized **tree** to 20 m, the young branches sparsely puberulous, soon becoming glabrous. **Leaves** oblong-elliptic, chartaceous, 6–14 × 2–5.5 cm, acuminate at apex, the acumen 6–20 cm long, subcuneate and slightly unequal at base, glabrous except for a few stiff appressed hairs towards base beneath; midrib impressed above, prominent and glabrous beneath; primary veins 9–13 pairs, arcuate, anastomosing; petioles 5–12 mm long, sparsely appressed pubescent, rugose, canaliculate. Stipules triangular, ca. 1 mm long, pubescent, caducous. **Flowers** hermaphrodite, borne in many-flowered sessile glomerules inserted on upper portion of petioles; pedicels 1.0–2 mm

long, pubescent; bracteoles *ca.* 0.4 mm long, pubescent, persistent. Calyx 2.5–3 mm long, grey-puberulous on exterior, lobes unequal. Corolla exerted beyond calyx lobes, with 2 large bicucullate lobes and 3 smaller simple lobes, the lobes united at base to form a distinct tube, the tube sparsely pubescent-glabrescent on exterior, lanate within. Fertile stamens 5(–4), alternating with corolla lobes, the filaments inserted at base of corolla lobes, lanate pubescent at base, staminodes absent.

Ovary 3 locular with 2 ovules in each loculus, pilose-tomentose on exterior. Style with trifid apex, pubescent throughout. **Fruit** not seen.

Type: BRAZIL. AMAZONAS: Manaus, *Ducke* 23657, (fl) (lectotype, RB; isolectotypes, G K P RBSUUS).

Endemic to terra firme forest in the vicinity of Manaus.

6.I.1977 (fl) *Silva, M. F. & Coêlho, D.* 2101 (INPA); 5.III.1996 (fl) *Sothers, C. A. et al.* 806 (IANINPA K MONYRBSPUUB).